Amendments to the Claims

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1.   (Currently Amended) A method for assaying multi-component mixtures comprising:

a. ~~introducing~~ generating light from a wide-band source of optical radiation and dividing the light into spectral components, and/or ~~extracting~~ selecting the assigned sections of monochromatic light with a spectral width of Δ_i from the light in the selected range of wave-lengths λ_i while ensuring the possibility of changing the spectral position of these sections with the assigned pitch $\Delta\lambda_i \geq \Delta_I$;

b. Focusing the ~~extracted~~ selected monochromatic light ~~onto~~ into a probing beam having a specified geometric shape, and directing the light onto a sample under analysis;

c. Irradiating a sample of a known mixture K to be analyzed and a sample of an unknown mixture U, by turns, with monochromatic light at the assigned wave-lengths λ_1, λ_2, ... λ_m from the selected spectral range λ_i;

d. Collecting light falling onto the sample, passing through the sample, or reflected by the sample, and directing the luminescent light to independent photo-detector devices;

e. Measuring the intensity values of the light
gathered on the photo detector for each of the extracted wave-
lengths λ_1, λ_2, ... λ_m of the selected spectral range λ_i, such
that, the probing light I_0, the light passing through a sample
or reflected by a sample I_T, and the luminescence light of a
sample I_L, including steps of decomposition of the luminescent
light into a variety of spectral sections, and/or sequential
extraction of the specified sections of wave-lengths of λ_1, λ_2,
... λ_n with a width of Δ_j, with the assigned pitch of $\Delta\lambda_j \geq \Delta_j$,
where each section corresponds with the predetermined .
characteristic wave-length of the light in the selected
spectral range λ_j, which is gathered and registered by a photo-
detector is measured;

f. Defining the relative intensity of the gathered
light passing through a sample, or reflected by a sample, at
each of extracted wave-lengths λ_m, and the luminescent light
for each of the extracted wave-lengths λ_m, λ_n for a known
mixture and unknown mixture, in accordance with the following
expressions:

$$T^K(\lambda_m) = \frac{I_T^K(\lambda_m)}{I_0^K(\lambda_m)}; \quad T^U(\lambda_m) = \frac{I_T^U(\lambda_m)}{I_0^U(\lambda_m)};$$

$$L^K(\lambda_m, \lambda_n) = \frac{I_L^K(\lambda_m, \lambda_n)}{I_0^K(\lambda_m)}; \quad L^U(\lambda_m, \lambda_n) = \frac{I_L^U(\lambda_m, \lambda_n)}{I_0^U(\lambda_m)}, \quad \text{where}$$

$I_T^K(\lambda_m), I_T^U(\lambda_m)$ - intensity values of passing or

reflected light for samples of a known K mixture and an unknown U mixture measured within the specified sections λ_1, λ_2, … λ_m of the extracted range of wave-lengths of incident radiation λ_i;

$I_L^K(\lambda_m, \lambda_n), I_L^U(\lambda_m, \lambda_n)$ - the luminescent intensity irradiated by a sample of a known K mixture and a sample of an unknown U mixture within the specified sections λ_1, λ_2, … λ_n of the extracted range of wave-lengths λ_j with light excitation within the specified sections λ_1, λ_2, … λ_m of the extracted range of wave-lengths λ_i;

$I_0^K(\lambda_m), I_0^U(\lambda_m)$ - intensity of incident probing radiation falling on the appropriate samples at the time of performing measurements;

g. Comparing the corresponding relative intensity values of the light passing through a sample, or reflected by a sample, ~~on~~at each of the extracted wave-lengths λ_m, and the luminescent light for each of the extracted wave-lengths λ_m, λ_n for a known mixture and an unknown mixture, and defining the compliance between the unknown mixture and the certain mixture by the following expression:

$$A = \frac{1}{2} \times \left(\frac{1}{m} \times \sum_{m=1}^{m} \frac{T^U(\lambda_m)}{T^K(\lambda_m)} + \frac{1}{m \times n} \times \sum_{m=1}^{m} \sum_{n=1}^{n} \frac{L^U(\lambda_m, \lambda_n)}{L^K(\lambda_m, \lambda_n)} \right) = 1 \pm \delta \text{ , where}$$

$T^K(\lambda_m), T^U(\lambda_m)$ - intensity values of passing or

reflected light for samples of a known K mixture and unknown U

mixture, standardized for the intensity of incident radiation

falling on a sample at the corresponding wave-length;

$L^K(\lambda_m, \lambda_n), L^U(\lambda_m, \lambda_n)$ - intensity values of the

luminescent light irradiated by a sample of a known K mixture

and unknown U mixture within the specified sections λ_1, λ_2, …

λ_n of the extracted range of wave-lengths λ_j with light

excitation within the specified sections λ_1, λ_2, … λ_m of the

extracted range of wave-lengths λ_i, normalized for intensity of

incident radiation falling on a sample at the corresponding

wavelength;

m, n – a number of extracted sections with the wave-

lengths under compared within the selected spectral ranges λ_i

and λ_j, accordingly;

δ - a value of allowable deflections of the

compared values for the unknown mixture being identified from

the corresponding values for the similar values of a standard

sample of a known mixture;

h. Defining the presence or absence of foreign

impurities in the mixture by the following expressions:

$$C_T(\lambda_i) = \frac{T^U(\lambda_{m+1})}{T^K(\lambda_{m+1})} - \frac{T^U(\lambda_m)}{T^K(\lambda_m)}; \quad C_L(\lambda_i, \lambda_j) = \frac{L^U(\lambda_{m+1}, \lambda_{n+1})}{L^K(\lambda_{m+1}, \lambda_{n+1})} - \frac{L^U(\lambda_m, \lambda_n)}{L^K(\lambda_m, \lambda_n)};$$

~~at the same time~~ wherein, if $C_T(\lambda_i) = C_L(\lambda_i, \lambda_j) = 0\pm\delta$, the foreign

impurities in the sample ~~being identified~~ are determined to be absent, ~~and the conclusion about the presence of unwanted contaminations in the mixture under study may be drawn when there are sections~~ wherein if $C_T(\lambda_i) > 0 \pm \delta$, and/or $C_L(\lambda_i, \lambda_j) \neq 0 \pm \delta$, ~~in the difference spectra~~ the foreign impurities in the sample are determined to be absent.

    2.   (Currently Amended) A method for analyzing a sample comprising multi-component mixture comprising:

    a. Obtaining an electronic-absorption-luminescent signature of the multicomponent mixture;

    b. Comparing the electronic absorption-luminescent signatures of the sample with the absorption-luminescent signature of a known mixture;

    c. Preparing calibration samples which represent a specially made-up mixture or multi-component solution of ~~a strictly identical constant compound~~ such component, for which the absorption or reflectance spectra, and luminescence spectra of which solution overlap with the corresponding spectra of a certain mixture within the selected analytical spectral ranges λ_i and λ_j, i.e. have nonzero intensity in the specified ranges;

    d. Placing a standard sample of a certain K mixture and a calibration Q sample into an analytical device;

e. Measuring and transforming measured values for intensity of the light passing through or reflected by standard and calibration samples, and their luminescent light, in accordance with steps a-e of Example 1, while taking into account the step of replacing an unknown U sample with the calibration Q sample;

f. Creating an electronic absorption-luminescent signature ALS_K of a standard sample as follows:

$$ALS_K = \|K_E\| = \left\| \begin{array}{cccc} \left(\dfrac{T_1^K}{T_1^Q}\right)\left(\dfrac{L_{1,1}^K}{L_{1,1}^Q}\right) & \cdots & \left(\dfrac{L_{1,n}^K}{L_{1,n}^Q}\right) \\ \cdots & \cdots & \cdots & \cdots \\ \left(\dfrac{T_m^K}{T_m^Q}\right)\left(\dfrac{L_{m,1}^K}{L_{m,1}^Q}\right) & \cdots & \left(\dfrac{L_{m,n}^K}{L_{m,n}^Q}\right) \end{array} \right\|, \quad \text{where:}$$

$T^K(\lambda_m), T^Q(\lambda_m)$ - intensity values of passing or reflected light for a sample of a known K mixture and a sample of a calibration Q mixture, standardized for intensity of incident radiation falling on a sample at the corresponding wave-length;

$L^K(\lambda_m,\lambda_n), L^Q(\lambda_m,\lambda_n)$ - intensity values of the luminescent light irradiated by a sample of a known K mixture and a calibration Q mixture within the specified sections λ_1, λ_2, … λ_n of the extracted range of wave-lengths λ_j with light excitation within the specified sections λ_1, λ_2, … λ_m of the

extracted range of wave-lengths λ_i, normalized for intensity of incident radiation falling on a sample at the corresponding wave-length;

g. Entering the electronic signature of a standard sample ALS_K into a computer database, and/or saving the electronic signature of the standard sample on an intermediate medium;

h. Repeating step (c) with a sample of an unknown mixture, including the step of replacing a standard sample K with a calibration sample Q, which is strictly identical with the calibration sample used when measuring a standard sample, and creating an electronic signature ALS_U of a sample being identified:

$$ALS_U = \|U_E\| = \left\| \begin{matrix} \left(\dfrac{T_1^U}{T_1^Q}\right)\left(\dfrac{L_{1,1}^U}{L_{1,1}^Q}\right)...\left(\dfrac{L_{1,n}^U}{L_{1,n}^Q}\right) \\ ... \quad ... \quad ... \quad ... \\ \left(\dfrac{T_m^U}{T_m^Q}\right)\left(\dfrac{L_{m,1}^U}{L_{m,1}^Q}\right)...\left(\dfrac{L_{m,n}^U}{L_{m,n}^Q}\right) \end{matrix} \right\| ;$$

i. Comparing electronic signatures of an unknown mixture $ALS_U = \|U_E\|$ being tested with similar data for a standard sample of a known mixture $ALS_K = \|K_E\|$ by the following expression:

$$\|A_{ALS}\| = \frac{\|U_E\|}{\|K_E\|} ,$$

such that, a conclusion on the identity of the unknown mixture and the certain mixture may be drawn when all ~~cells~~ elements of the matrix $\|A_{ALS}\|$ contain only unit elements (i.e. $a_i = a_{i,j} = 1 \pm \delta$);

j.   Defining the presence or absence of unwanted contaminations for the mixture under study by the following expression:

$$\|C_{ALS}\| = \frac{\|U_E\| - \|K_E\|}{\|K_E\|} \ ,$$

~~at the same time, a determining the presence of unwanted contaminations in the mixture~~ wherein if the matrix $\|C_{ALS}\|$ ~~when in the matrix there~~ comprises ~~are~~ nonzero elements, the values of which exceed the value of allowable deflections from the correspondence values of the standard sample of the known mixture, $|c_x,\ c_{xy}| > |\pm\delta|$, ~~the values of which exceed the value of allowable deflections of the values being compared for the unknown mixture being identified, from the corresponding values for the similar values of a standard sample of a certain mixture~~ the sample under analysis is determined to contain the unwanted contaminations~~,~~.

3.   (Currently Amended) The method according to claim 1 further comprising measuring intensity values of Raman scattering of the ~~identified~~ sample under analysis and a

standard sample including the following steps:

a.   irradiating the sample and a known mixture, by turns, with a monochromatic line of a narrow-band (lined) source of light at one or several selected fixed frequencies v_r;

b.   Gathering the light of Raman scattering onto a photo-detector device;

c.   Measuring the intensity of each of the extracted frequencies v_1, v_2, ... ,v_p of the selected spectral range, gathered onto a photo-detector of the line, namely: the exciting light falling on a sample I_{ex}, and the light of Raman scattering of a sample I_R, including steps of decomposition of the light of Raman scattering into a variety of spectral sections, and/or sequential extraction of the specified frequency sections v_1, v_2, ... ,v_p with a width of Δ_r, with assigned pitch $\Delta v_r \geq \Delta_r$, where each section corresponds to the predetermined characteristic frequency of the light in the selected spectral range v_r, which is gathered and registered by a photo-detector;

d.   Defining the relative intensity of the gathered light of Raman scattering at each of the extracted frequencies v_1, v_2, ...,v_p for a known and unknown mixtures in accordance with the following expressions:

$$R^K(v_{ex}, v_p) = \frac{I_R^K(v_{ex}, v_p)}{I_{ex}^K}; \quad R^U(v_{ex}, v_p) = \frac{I_R^U(v_{ex}, v_p)}{I_{ex}^U};$$

where:

$I_R^K(v_{ex}, v_p), I_R^U(v_{ex}, v_p)$ - intensity of Raman scattering irradiated by

a sample of a known K mixture and a sample of an unknown U

mixture within the specified sections v_1, v_2, ... v_p of the

extracted frequency range v_r with light excitation at one of

the selected frequencies v_{ex};

I_{ex}^K, I_{ex}^U - intensity of the exciting light falling on

corresponding samples at the time of performing measurements;

     e.   Comparing data for the mixture being tested

with similar data for a standard sample of a known mixture by

the following expression:

$$A = \frac{1}{2} \times \left(\frac{R^U(v_{ex}, v_p)}{R^K(v_{ex}, v_p)} \right) \times \left(\frac{1}{m} \times \sum_{m=1}^{m} \frac{T^U(\lambda_m)}{T^K(\lambda_m)} + \frac{1}{m \times n} \times \sum_{m=1}^{m} \sum_{n=1}^{n} \frac{L^U(\lambda_m, \lambda_n)}{L^K(\lambda_m, \lambda_n)} \right),$$

Wherein the unknown mixture and the known mixture are defined

as being identical ~~when~~ if $A = 1 \pm \delta$.

     4.   (Currently Amended) The method according to

claim 2 comprising comparing electronic signatures containing

along with spectral profiles of absorption, ~~luminescence~~ and

luminescent intensities, spectral profiles of Raman scattering

intensities for ~~the mixture~~an unknown (RALS_U) and a standard

sample (RALS_K), ~~which~~that ~~electronic signatures~~ are formed by

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the method of claim 3, wherein the Raman matrixes are normalized in the following way:

a. Preparing a calibration sample Q_R, which calibration sample represents a specially made-up mixture or a multi-component solution of ~~a strictly identical constant~~such compound for which~~,~~ the luminescence spectrum ~~of which~~ overlaps with the Raman spectrum of the known mixture within the selected analytical spectral ranges;

b. Measuring the intensity of Raman scattering, and converting the results as in steps b-f of claim 2;

c. Comparing the signatures of a standard sample and the mixture being identified in accordance with the following expressions:

$$\|K_R\| = \left\| \begin{matrix} \left(\dfrac{R^K_{1,1}}{L^{Q_R}_{1,1}}\right) \cdots \left(\dfrac{R^K_{1,p}}{L^K_{1,p}}\right) \\ \cdots \quad \cdots \quad \cdots \\ \left(\dfrac{R^K_{q,1}}{L^{Q_R}_{q,1}}\right) \cdots \left(\dfrac{R^K_{q,p}}{L^{Q_R}_{q,p}}\right) \end{matrix} \right\| \quad \text{и} \quad \|U_R\| = \left\| \begin{matrix} \left(\dfrac{R^U_{1,1}}{L^{Q_R}_{1,1}}\right) \cdots \left(\dfrac{R^U_{1,p}}{L^K_{1,p}}\right) \\ \cdots \quad \cdots \quad \cdots \\ \left(\dfrac{R^U_{q,1}}{L^{Q_R}_{q,1}}\right) \cdots \left(\dfrac{R^U_{q,p}}{L^{Q_R}_{q,p}}\right) \end{matrix} \right\|, \quad \text{where}$$

$R^K_{q,p}, R^U_{q,p}$ - intensity values of Raman light scattering, normalized for intensity of the exciting light I_{ex}, for samples of the known K mixture and the unknown U mixture, measured at the frequencies I_p with light excitation at the frequency I_q;

$L^{Q_R}_{q,p}$ - the luminescence intensity for a calibration sample Q_R, normalized for the intensity of the exciting light I_{ex};

d. Pairing the electronic signatures of the mixture $\|U_E\|$ being tested with similar data for a standard sample of a known mixture $\|K_E\|$, including the step of comparing Raman matrixes (RALS$_{U,K}$), by the following expression:

$$\|A_{RALS}\| = \left(\frac{\|U_R\|}{\|K_R\|}\right) \times \left(\frac{\|U_E\|}{\|K_E\|}\right),$$

where the identity of samples is defined by the following attribute: $\|A_{RALS}\| = 1 \pm \delta$.

5. (Currently Amended) The method according to claim 1 wherein ~~samples~~ the sample of the mixture ~~being identified~~ under analysis and the standard mixture are dissolved in appropriate solvents.

6. (Currently Amended) The method according to claim 1 wherein the ~~mixture~~ multi-component compound of impurities and/or contaminations in the water system being analyzed is water.